MERAMEC RIVER

WATERSHED

DEMONSTRATION PROJECT

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U.S. Environmental Protection Agency

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EXECUTIVE SUMMARY

Project Overview

The overall purpose of the Meramec River Watershed Demonstration Project is to bring together relevant information about the Meramec River basin and evaluate the status of the stream, watershed, and wetland resource base. The project has three primary objectives, which have been met. The objectives are: 1) Prepare an inventory of the Meramec River basin to provide background information about past and present conditions. 2) Facilitate the reduction of riparian wetland losses through identification of priority areas for protection and management. 3) Identify potential partners and programs to assist citizens in selecting approaches to the management of the Meramec River system. These objectives are dealt with in the following sections titled Inventory, Geographic Information Systems (GIS) Analyses, and Action Plan.

Inventory

The Meramec River basin is located in east central Missouri in Crawford, Dent, Franklin, Iron, Jefferson, Phelps, Reynolds, St. Louis, Texas, and Washington counties. Found in the northeast corner of the Ozark Highlands, the Meramec River and its tributaries drain 2,149 square miles. The main stem of the Meramec's 218 linear miles carries water from the lightly populated, forested, and agricultural upper watershed north easterly to the heavily populated and urbanized lower watershed to enter the Mississippi River below St. Louis. Meramec tributaries of fifth order or greater include Courtois, Crooked, Dry, Dry Fork, Huzzah, and Indian creeks and the Little Meramec River. Meramec base flows are well sustained by springs characteristic of the region's karst topography and by drainage from the Big and Bourbeuse rivers, two major tributaries large enough to merit their own basin inventory and management plans. The Bourbeuse enters the Meramec at river mile 64.0, and the Big River enters the Meramec at river mile 35.7.

Present Meramec River basin landcover consists of roughly one-half forest, one-quarter pasture, and one-quarter cropland, rural transportation, urban development, water, and other minor land uses combined. Within the upper Meramec River portion, nearly one third of the forest land is privately owned. The Mark Twain National Forest covers a large area in the remaining two thirds. Major resource uses within the Meramec River basin include grazing, logging, and mining lead, iron, sand and gravel. Earlier land-use practices have been identified as possible causes for stream morphology changes in the Meramec as well as other stream systems within the Ozarks. There is a current trend toward increasing numbers of cattle and increasing grazing density. Where cattle have free access to streams, this trend causes more stream-channel disturbance. Also, gravel mining contributes to the accelerated transport of sediments in the Meramec River basin.

Overall, water quality within the Meramec River basin is quite good. In fact, the Missouri Department of Natural Resources Clean Water Commission designated segments of Courtois Creek, Huzzah Creek, Blue Springs Creek, and the Meramec River as Outstanding State Resource Waters. Despite the basin's overall good water quality, problems do exist. In the upper and middle basin, cattle grazing on creek bottom pastures is very common. When cattle have open access to streams, damage to riparian areas and excessive nutrient loading of the streams often results. In the upper basin, impoundments containing tailings from mining operations pose a potential threat to stream water quality. The lower watershed from Eureka to Fenton is an urbanized zone that poses other threats to water quality. Sediment and pollution-laden runoff enter the lower Meramec system rapidly because of impervious surfaces from development and the channelization of tributaries.

Stream habitat quality is fair to good throughout most of the basin. Some areas, including portions of the Brazil subwatershed, Courtois, Huzzah, and Indian Creek watersheds, suffer from a more severe lack of riparian vegetation. In these and other streams the lack of adequate riparian corridors, excessive nutrient loading, streambank erosion, excessive runoff and erosion, and the effects of extensive instream gravel mining are among the problems observed. Grazing practices along many streams contribute to streambank instability, nutrient loading, and poor riparian corridor conditions. Increased land clearing and higher runoff associated with urbanization also impact stream habitat quality.

The basin has a very diverse fish assemblage of 125 fish species collected since 1930. The crystal darter, a state listed species, is present in the lower Meramec Basin. Excellent sportfishing is available on the Meramec and its tributaries, and basin streams are widely acclaimed, particularly for smallmouth bass and rock bass. Sportfishing management emphasis species are smallmouth bass, largemouth bass, rock bass, brown trout, and rainbow trout. Crawford County contains the Meramec River Smallmouth Bass Special Management Area (from Highway 8 to Scott’s Ford Access), the Meramec River Special Trout Management Area (from Scott’s Ford Access to Bird’s Nest Access), and the Blue Springs Creek Wild Trout Management Area. The heavily fished Maramec Spring Park lies immediately adjacent to the Meramec in Phelps County. The taking of non-gamefish (mainly sucker species) by gigging is a strong tradition throughout the basin. Floating and float-fishing are highly popular, particularly on the upper Meramec, Huzzah, and Courtois. Seventeen Missouri Department of Conservation (MDC) stream access sites are located in the basin. Access to stream frontage is also provided by a mix of MDC conservation areas, Missouri Department of Natural Resources (MDNR) state parks, county parks, and United States Forest Service (USFS) lands.

Meramec mussel populations have been surveyed periodically. Relative abundances are declining, and habitat disturbances are the suspected cause. Fortunately, the endangered pink mucket (federal listing) is still maintaining a presence in the lower Meramec.

The Meramec River basin contains 8 species of crayfish and many aquatic insect groups, including pollution intolerant species that require clear, well-oxygenated, unpolluted streams. Unusual macroinvertebrates found in the Maramec Spring system include the cave crayfish (*Cambarus hubrichti*) and a caddisfly, *Glyphopsyche missouri* Ross. The cave crayfish inhabits the subterranean spring system while *Glyphopsyche missouri* is found in the spring branch. Maramec Spring is the only known location of *Glyphopsyche missouri* in the world.

GIS Analyses

The initial goal of the GIS analyses part of the project was to produce many different large-scale GIS layers for the Meramec River basin with a final objective of using the products to prioritize wetlands for protection through acquisition or voluntary stream incentive programs. Six prioritization analyses were completed to answer wetland protection objectives: stream prioritization, watershed landcover prioritization, stream landcover prioritization, fish nursery wetland identification, wetland prioritization, and fish community prioritization. Three other analyses, spectaclecase mussel distribution, slender madtom distribution, and species richness comparison, were used to guide future sampling efforts, to understand distribution of species, and to identify the effects of various human activities on the aquatic resource.

The stream prioritization analysis was performed to find stream segments near public land and near sites known to provide habitat for endangered species, or within reaches with spawning season restrictions for sand and gravel mining. The resulting selected set of 528 priority stream segments form only 5.6% of the 9,364 major stream segments for the basin. A series of seven GIS layers identifying either attractive features on or around the streams, such as springs or observed natural heritage species, or degrading features, such as chemical spill sites or mines, have been made available to further assess specific lands identified by any of the protection analyses.

Watershed landcover prioritization involved merging the project subwatershed layer with the landcover classification, and then rating the subwatersheds based on the percentages of certain landcover types, such as the Forest or Urban classes. Rated subwatersheds in order of most negatively impacted to the least negatively impacted watersheds were: Mattese Creek, Lower Lower Meramec. Lower Meramec Mainstem 5, Grand Glaise Creek, Fishpot Creek, Fishwater Creek, Dry Branch, Lower Courtois Creek, Billy’s Branch, and Upper Indian Creek. Subwatersheds with greatest area of cropland from most to least were: LowMid Meramec main stem 6, Calvey Creek, LowMid Meramec main stem 3, Dry Fork main stem 1, and Lower Meramec main stem 6. Lastly, the subwatersheds with greatest area of grasslands were from most to least: Upper Dry Fork, Dry Fork main stem 1, Little Dry Fork, Spring Creek, and Norman Creek.

Stream landcover prioritization involved merging the landcover classification with streams and a 90-meter buffer area around them to identify the landcover type percentages about the streams. The merged stream-landcover GIS layer enables the biologist or planner to identify with simple queries those places in the basin where extensive row crop agriculture is occurring in close proximity to the stream channel. The relationship between cropland and streams varies among the subwatersheds, and significant reaches of unprotected streambanks can occur in any subwatershed with cropland. This analysis produced a data set with 71.0 kilometers (44.1 miles) of streams that have a high potential for receiving sediment and farm chemicals, because they are adjacent to cropland and may have little or no corridor.

In the fish nursery wetland identification analysis, a set of potential fish nursery wetland areas were selected. The results were used to provide one of the criteria for the wetland prioritization analysis. The analysis utilized the National Wetland Inventory system of classes and modifiers to select among the many types of Palustrine wetlands. These selected wetlands were then reduced to those that have a direct connection to perennial streams to ensure juvenile fish could have access to the stream resource when they mature. Field reconnaissance further determined the accuracy of potential nursery areas. Out of these natural wetlands, only 398, or 2.5% of the total are inundated for extended periods. Out of these 398, 31 wetlands, which comprise only 0.12% of the total number of wetlands, had connectivity to perennial streams and were selected as potential fish nursery wetlands. Natural wetlands that might provide habitat for extended periods of time and have direct connection to water filled segments of the stream network, prove to be rare in the Meramec River basin.

In the wetland prioritization analysis, wetlands were rated according to a series of criteria that are based not only on the rarity or importance of the wetland type, but also on the local land use, as well as the proximity of the wetland to either beneficial areas (public land) or potentially degrading ones (encroaching urban areas). Rated wetlands had to be natural and Palustrine. Natural wetlands comprised

11.8% on public land (already protected), 43.6% within a mile of public land, 8.4% within a city limit, and 16.7% within a mile of a town. Thirteen protection area polygons (delineations) encompassed the areas with the densest clumps of highly rated wetlands. These areas were, from largest wetland clusters to smallest wetland clusters and with a polygonal (delineated) wetland rating, respectively, from 1-13: Saline Creek, Pacific, Eureka, Telegraph Road, Steelville, St. Clair, Salem, Crooked Creek, Scotts Ford/Riverview, The Eagle, Courtois/Lost Creek, Huzzah CA, and Short Bend.

The fish community prioritization analysis was done to prioritize areas for protection. Criteria used for the analysis were: 1) species richness, 2) habitat characteristics such as the presence of wetlands and springs, 3) public land, and 4) the presence of human impacts, such as mining sites or chemical dumping sites. The first analysis was a statistical analysis on the above dataset. Only weak correlations were found between the datasets. The second analysis used a ranking system (four to 18, the higher the value the more suitable the stratum) to determine which strata might be recommended for land acquisition. The highest score from the analysis was 16 for strata F. Thirteen strata received scores of 12 or below. The nine remaining strata scoring above 12 were considered.

Analyses were done to investigate the sampled range of aquatic habitat attribute values (stream order, gradient, miles to headwater) from collection sites making a "signature" for a species. These signatures were then used to select stream segments with the same attribute values in order to predict the potential range of the endangered spectaclecase mussel and the slender madtom. The spectaclecase sampled range was confined to the Meramec River from river mile 10.0 to 136.2, or a total of 126.3 stream miles. The predicted range using GIS was 167.9 stream miles, a potential range that was 32.9% greater than the length of the sampled range. The predicted range of the slender madtom was extensive, 794.8 miles, or approximately 4.5 times the sampled range, which was 176.3 miles in extent. Differences between potential range and actual range point to the need to investigate possible factors contributing to the apparent discrepancy.

Action Plan

Major goals for the Meramec River watershed are improving water quality, improving riparian and aquatic habitat conditions, maintaining diverse and abundant populations of native aquatic organisms and sportfish, providing for a high level of recreational use, and increasing public appreciation for the stream resources. Cooperative efforts with other resource agencies on water quality, habitat, and watershed management issues will be critical. Enforcement of existing water quality and other stream-related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions, better water quality, and a healthier stream system.

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